

**WarpCube E6**  
**10 mm XY2-100 Scanhead**

**Users Manual**

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# 1 Copyright

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## 2 History

Date	Changes in document
01/2018	Scanning angle added
11/2017	Mechanical drawings updated, functional description added
01/2017	Power supply information extended
09/2016	Initial version

## 3 Safety

The hardware component described within this document is designed to be part of a laser scanner system which itself can be part of a machine. Laser radiation may effect a person's health or may otherwise cause damage. Prior to installation and operation compliance with all relevant safety regulations including additional hardware-controlled safety measures has to be secured. The client shall solely be responsible to strictly comply with all applicable and relevant safety regulations regarding installation and operation of the system at any time.

The hardware component described here is shipped without prefabricated equipment for electric installation. It is intended to be integrated in machines or other equipment. It is not for use "as is". Prior to operation compliance with all relevant electric / electromagnetic safety regulations including additional hardware-controlled safety measures has to be secured. The client shall solely be responsible to strictly comply with all applicable and relevant regulations regarding installation and operation of the system at any time.

The scanhead described here is designed to deflect an input laser beam and output it again. It can't block or weaken the laser beam. To prevent unwanted emission of the laser beam, above a particular danger class the laser device must be fitted with a shutter or any other suitable device. This laser device must be of sufficient quality so that the laser beam can only be emitted at the beam output on the deflection unit. Proper warning signs have to be attached at the machine or device where this scanhead is used so clearly inform any user about all possible dangerous operations.

The surfaces of the scanheads mirrors are extremely sensitive and should not be touched in any way and may only be cleaned by experienced personnel. Thus we strongly recommend sending the deflection unit in to HALaser Systems for the mirrors to be cleaned, as opening of the scanhead by unauthorized personnel voids the warranty.



To improve the optical properties of the mirrors, lenses or protection glasses, different material are applied as coatings. Some of them may be potentially hazardous to health if inhaled or swallowed. Under normal circumstances, no special precautions are necessary when handling or storing mirrors, lenses or protection glasses with such specific coatings.

In case of damage to such a component and/or coating, follow these instructions:

- switch off the laser immediately
- avoid inhaling dust of possibly broken or burned components
- leave the room for at least 30 minutes
- wear gloves and a mouth protector while performing all the subsequent steps
- pack the optical elements in an airtight sealed plastic container, in case of fragments carefully collect up all fragments
- clean all contaminated components and surfaces with a damp cloth and pack the cleaning cloths in a sealed plastic container too
- ensure professional disposal of the container, optionally you also can return them to your supplier

Please note: these general instructions are relevant only in case special coatings are used on any of the optical components. This includes also third party components which may be operated together with the WarpCube scanhead (like F-Theta lenses or protection glasses). For detailed information about the used coatings, their dangerousness and for specific handling instructions in case of normal operation or damages, please contact the supplier of the related components.

## 4 Overview

This document describes the WarpCube E6 XY2-100 scanhead, its characteristics and usage.

This scanhead is a component according to Low Voltage Directive (LVD) 2006/95/EC of the European Union which can be used as part of a laser scanning system which itself can be part of a machine.

This document contains important information on qualified and safe handling of the WarpCube E6 scanhead. Therefore you should familiarize yourself with the content of this manual before using the scanhead for the first time. Furthermore this manual must be accessible to anyone who will be involved in developing, installing or using a laser device featuring the WarpCube E6 scanhead. When the scanhead is sold on, this operating manual or an authorized copy must be passed on with it.

## 5 Features and Technical Data


The WarpCube E6 scanhead offers following interfaces and features:



1. XY2-100 data interface and power connector
2. beam entrance
3. M85x1 lens ring (can be removed)
4. M5 laser and head mounting screw holes

The scanhead offers the following functions and features:

Type	digital/analogue
Interface	two-channel XY2-100 (2D)
Power supply requirements	+/-15 V / 2 A
Idle power consumption (no galvo movements)	7 W
Mirror size	10 mm
Maximum Laser Power	50 W <sup>1)</sup>
Screw thread for optics	M79 x1 (M85 x1 with lens ring)
Positioning speed	up to 7000 mm/sec
Marking speed	up to 3500 mm/sec
Writing speed	650 cps
Resolution	10 $\mu$ rad
Total scanning angle (optical)	40 degrees
Scanner Lag (Tracking error)	0,18 msec
1% step response setting full scale	0,36 msec
Scale drift	<80 ppm/°C
Zero drift	<50 $\mu$ rad/°C
Long term drift	0,3 mrad
Operating temperature	25°C +/-10°C
Weight	1,7 kg (with lens ring)
EU Customs Product Code	90139090

 <sup>1)</sup> at mirrors nominal wavelength, requires precise central justification of the laser and utilisation of full available mirror surface; customer has to take care the laser does not hit the mounting points off the mirrors, this would lead to damage of the scanhead together with a loss of any kind of warranty. When mirrors are replaced, higher laser powers could be possible, but additional cooling of the head may be necessary.

## 6 Functional Description

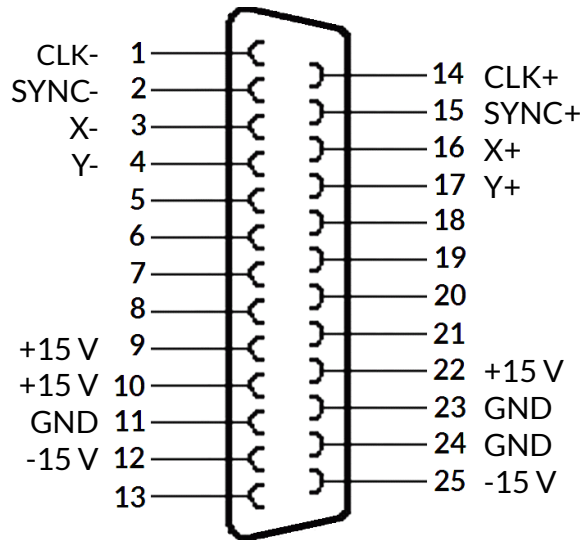
The WarpCube E6 scanhead can be used to deflect a laser beam in X and Y direction. This results in an area within which a laser can be moved to any position. This area is known as "marking field". This operation is performed by two mirrors, each of which is moved by a galvanometer scanner. The scanhead itself provides a beam input, into which the laser beam is fed, and a beam output, through which the laser beam is emitted from the unit after deflection. Only suitable lasers have to be fed into the beam input. Depending on some additional equipment, the beam output is either open or fitted with an F-Theta lens or protection glass.

An F-Theta lens is an optical component which is specially designed for use with 2-axis scanheads. It focuses the laser beam at optimum quality on any position in the marking field with a nearly constant beam length at all marking positions. Thus the desired marking field has to fit to an F-Theta lenses nominal size. At the same time such a lens provides partial optical compensation for the distortion that is unavoidable when using a two-axis scanhead unit. The remaining distortion must be compensated by the scanner controller card and/or the controlling software.



## 7 Electrical Connection

The scanhead is compatible with the industry standard XY2-100 data interface that is available on several industry-grade scanner controller cards (like E1701D or E1803D controller, please refer to <https://halaser.eu/compare.php> for details). The pin out and voltage supply connections are shown below and require a male D-SUB25 connector:



The power supply needs to support at least 2 A current drain and needs to be a balanced +/- 15 V (+/- 0.25 V tolerance).

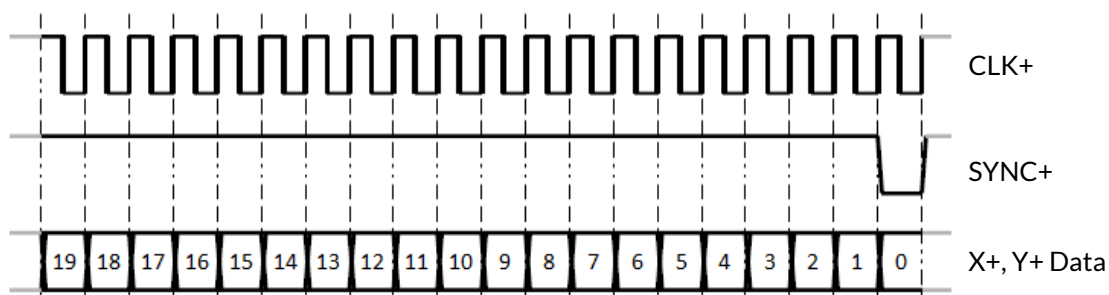
**!** When E1701D scanner controller is used, power needs to be feed into the head but never into the scanner controller card, here pins 9..13 and 22..25 need to be disconnected in direction to scanner controller. Beside of that, tune-mode 1024 has to be enabled (in e1701.cfg) in order to get enhanced performance of the head.

When E1803D scanner controller is used, scanhead can be powered via controller card, it is not necessary to feed in power at head directly (please refer to manual of E1803D controller for details).

**!** For any other scanner controller card: Power has to be feed into scanhead only but never into connected controller card!

**!** ATTENTION: During operation it has to be ensured the symmetric power with + 15 V and - 15 V is available all the time. Switching off one of both or unplugging the D-SUB25 connector during operation may damage electronics and - as follow up - the mirrors too.

The data to be submitted to the D-SUB25 connector of the scanhead have to be conform to XY2-100 specification:



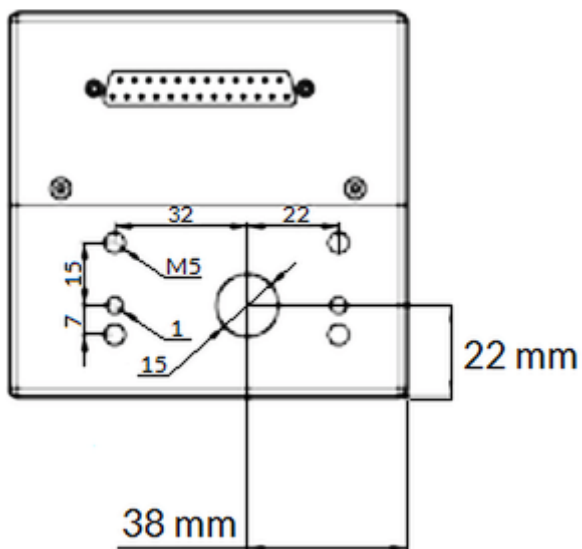
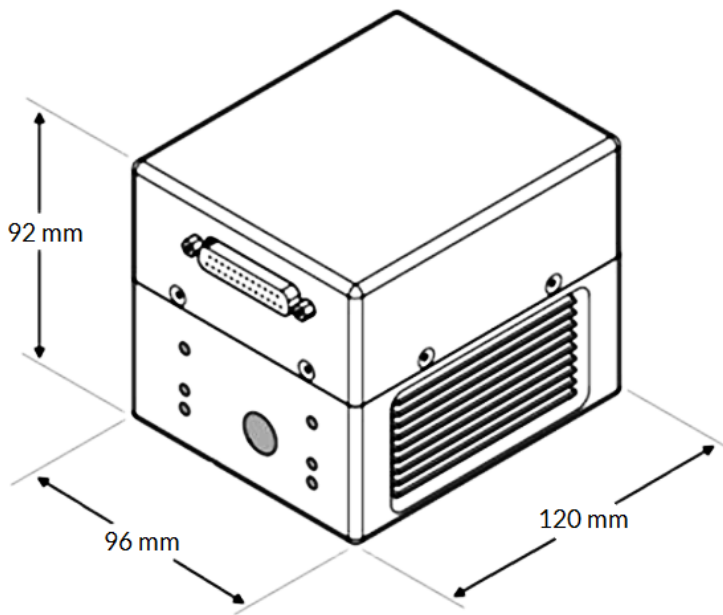
In standard 16 bit operating mode first three bits are set to 001, then 16 bit position data followed by a parity bit (even parity) are transmitted:

19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	1	D15..D0 position data															Pe	

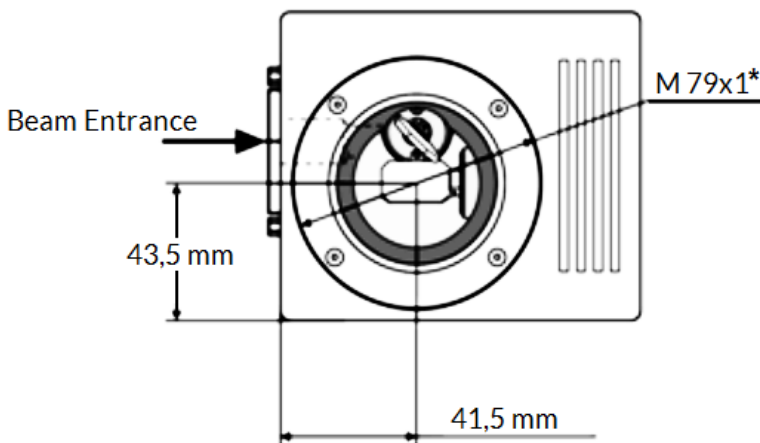
These 20 bit frames need to have a length of 10  $\mu$ sec and need to be repeated continuously every 10  $\mu$ sec.

# 8 Mechanical Specifications

Dimensions (without lens ring):



Drawing Beam Entrance Side



Drawing Beam Exit Side

\*) M85 x1 with included lens ring



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